

Express Mail Label No. EV 318 173 781 US

Date of Mailing June 27, 2003

PATENT  
**Case No. GP-303671**  
(2760/112)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: METHOD AND SYSTEM FOR AUTOMATIC  
CALLING UNIT REPLENISHMENT

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## METHOD AND SYSTEM FOR AUTOMATIC CALLING UNIT REPLENISHMENT

### 5 FIELD OF THE INVENTION

This invention relates generally to data transmission over a wireless communication system. More specifically, the invention relates to a method and system for replenishing cellular phone calling units.

### 10 BACKGROUND OF THE INVENTION

Many passenger vehicles now incorporate an integrated communication system. A Vehicle Communication Unit (VCU) used in conjunction with a Wide Area Network (WAN) such as a cellular telephone network or a satellite communication system allows for a variety of fee-based subscription services to be provided in a mobile environment. One such service provides for the use of a wireless phone within the vehicle. Users of these services find them convenient and at times a lifesaver in emergency situations.

One drawback to these fee-based subscription services, however, is the subscription cost which, at times, can be quite high. The cost of a plan may be based on many factors. The cost may be based on such factors as, for example, the total number of months duration of the plan, the number of minutes allowed per month, and the time of day a call is placed. Fortunately, service providers have a wide variety of plans available to suit most consumers' budgets.

A problem arises, though, when the subscriber uses the cellular phone for more than the amount of minutes allotted for a particular billing cycle. Depending on the service provider and other billing factors, the cost for these additional minutes can be very high. For example, a service provider may offer a plan where the cost is under one cent per minute. However, the cost per minute over the plan limit may be twenty-five cents or more. For most situations staying

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within the allotted number of minutes is not a problem. However, the probability of incurring additional fees is high for those who may travel extensively or who use the cellular phone for work. Excessive fees may also be a problem for  
5 parents that provide a cellular phone to their talkative children.

Some cellular phone providers offer inconvenient solutions to these problems. One solution provided is a prepaid cellular phone with a finite number of minutes, that upon their use the phone will not function. Another option is a calling card, also with prepaid minutes. Calling cards provide an inconvenient  
10 solution due to the requirement that the user must input a long string of digits that corresponds to the calling card and then the telephone number of the party they are trying to contact. Further, calling cards are easily lost or misplaced.

It would be desirable, therefore, to provide a system and method for replenishing calling units to a cellular phone that overcomes these and other  
15 disadvantages.

## SUMMARY OF THE INVENTION

One aspect of the invention is a method for replenishing calling units for a wireless communications device. The method comprises receiving a calling plan configuration signal at the wireless communication device; and setting a  
5 predetermined calling termination configuration based on the calling plan configuration signal.

Another aspect of the invention provides a computer usable medium including a program for replenishing calling units for a wireless communications  
10 device. The program includes computer program code for receiving a calling plan configuration signal at the wireless communication device; and computer program code for setting a predetermined calling termination configuration based on the calling plan configuration signal.

Another aspect of the invention provides a system for replenishing cellular  
15 phone calling units in a mobile vehicle. The system includes means for receiving a calling plan configuration signal at the wireless communication device; and means for setting a predetermined calling termination configuration based on the calling plan configuration signal.

The aforementioned, and other features and advantages of the invention  
20 will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

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## BRIEF DESCRIPTION OF THE DRAWINGS

**FIG. 1** is an illustration of one embodiment of a system for replenishing cellular phone calling units in a mobile vehicle, in accordance with the current invention; and

**FIG. 2** is a flow diagram of one embodiment of a method for replenishing cellular phone calling units in a mobile vehicle, in accordance with the current invention.

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## DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

**FIG.1** shows an illustration of one embodiment of a system for replenishing cellular phone calling units in a mobile vehicle, in accordance with the present invention at **100**. Cell-phone unit replenishment system **100** may use current hardware within telecommunication systems and networks that are enabled by code division multiple access technology (CDMA), but implement new software applications and methods to replenish cellular phone calling units.

Cell-phone unit replenishment system **100** contains one or more mobile vehicles **110**, one or more telematics units **120**, one or more wireless carrier systems **115** of a wireless service provider, one or more communication networks **130**, one or more land networks **140**, and one or more call centers **150**. Call center **150** includes one or more switches **151**, one or more data transmission devices **152**, one or more communication services managers **153**, one or more communication services databases **154**, one or more advisors **155**, and one or more bus systems **156**.

Mobile vehicle **110** is a vehicle equipped with suitable hardware and software for transmitting and receiving voice and data communications. Mobile vehicle **110** contains telematics unit **120**. Telematics unit **120** may include a digital signal processor (DSP) **122** connected to a wireless analog, digital or dual-  
5 mode modem **124**, a global positioning system (GPS) unit **126**, an in-vehicle memory **125**, a microphone **121**, one or more speakers **123**, and a wireless communication device **127**. Wireless communication device **127** may be an in-vehicle mobile (cellular) phone. In-vehicle mobile phone **127** may be an analog, digital, or dual-mode cellular phone.

10 DSP **122** uses instructions and data from a computer usable medium that contains various computer programs for controlling programming and operational modes within mobile vehicle **110**. Digital signals activate programming and operational modes, as well as provide input and output data. DSP **122** may direct communications from the telematics unit **120** through mobile phone **127**.

15 Telematics unit **120** contains an in-vehicle wireless communication device such as a digital mobile or cellular phone **127** with suitable hardware and software for transmitting and receiving data communications. Mobile phone **127** may be a CDMA-enabled, TDMA-enabled, or GSM-enabled communication device. Mobile vehicle **110** sends to and receives radio transmissions from  
20 wireless carrier system **115**. Mobile vehicle **110** may also contain a central processing unit (CPU), a controller, a microcontroller, or a host processor with software and additional hardware to enable communications with the mobile vehicle and to perform other routines and requested services.

In one embodiment, wireless carrier system **115** may be a wireless  
25 communications carrier. Wireless carrier system **115** may be, for example, a mobile telephone system or station. The mobile telephone system may be a digital mobile telephone system operating over a prescribed band nominally at 800 MHz, 900 MHz, 1900 MHz, or any suitable band capable of carrying mobile communications. The wireless vehicle communication device may be enabled by  
30 code division multiple access technology (CDMA) with greater call capacity than

narrowband multiple access wireless technologies. Wireless carrier system **115** transmits to and receives signals from mobile vehicle **110**. Wireless carrier system **115** may also transmit to and receive signals from a second mobile vehicle **110**. Wireless carrier system **115** may be connected with

5 communications network **130**.

Communications network **130** comprises a mobile switching center (MSC), also known as a mobile telephone switching office (MTSO). Communications network **130** comprises services from one or more wireless communications companies. Communications network **130** includes any suitable system or  
10 collection of systems for connecting wireless carrier system **115** to a second mobile vehicle **110** or to a call center. In one embodiment, land network **140** is a public-switched telephone network. Land network **140** may be comprised of a wired network, an optical network, a fiber network, another wireless network, or any combination thereof. Land network **140** comprises an Internet protocol (IP)  
15 network. Land network **140** connects communications network **130** to a call center.

In one embodiment, land network **140** connects a first wireless carrier system **115** with a second wireless carrier system **115**. Communication network **130** and land network **140** may connect wireless carrier system **115** to a  
20 communication node or call center **150**.

Call center **150** may be a location where many calls may be received and serviced at the same time, or where many calls may be sent at the same time. Alternatively, call center **150** may be a telematics service call center, prescribing communications to and from mobile vehicles **110**. The call center may be a  
25 voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. In one embodiment, the call center contains each of these functions to provide requested subscriber services.

These services include, but are not limited to enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Telematics service call center **150** may also manage personal calling plans negotiated with local wireless carrier providers in the home area of a driver.

The call center **150** contains switch **151**. Switch **151** is connected to land network **140**, and may receive a modem carrier signal from an analog modem or from a digital modem. Switch **151** transmits voice or data transmission from the communication node and may also receive voice or data transmissions from mobile vehicle **110** through wireless carrier system **115**, communications network **130**, and land network **140**. Further, switch **151** receives from or sends data transmissions to data transmission device **152**. Switch **151** may also receive from or send voice transmissions to advisor **155** via bus system **156**.

Data transmission device **152** sends or receives data from switch **151**. Data transmission device **152** may be an IP router or a modem. Data transmission device **152** may transfer data to or from advisor **155**, one or more communication services managers **153**, one or more communication services databases **154**, and any other device connected to bus system **156**. Data transmission device **152** also conveys information received from land network **140** to communication services manager **153**. Communication services manager **153** is connected to switch **151**, data transmission device **152**, and advisor **155** through bus system **156**. The call center includes any combination of hardware or software facilitating data transmissions between call center **150** and mobile vehicle **110**.

Communication services manager **153** receives information from mobile vehicle **110** through wireless carrier system **115**, communication network **130**, land network **140**, and data transmission device **152**. Communication services manager **153** may send information to mobile vehicle **110** through data



transmission device **152**, land network **140**, communication network **130** and wireless carrier system **115**. Communication services manager **153** may also determine whether a communication should be sent to mobile vehicle **110**,

5 provide further requests and determinations based on a reply from mobile vehicle **110** and provide information to mobile vehicle **110** from communication services database **154**.

Communication services database **154** contains records on one or more mobile vehicles **110**. Records in communication services database **154** may  
10 include vehicle identification, location information, status information, and recent action information regarding mobile vehicle **110**. Communication services database **154** provides information and other support to communication services manager **153**.

Advisor **155** may be a real advisor or a virtual advisor. A real advisor is a  
15 human being in verbal communication with mobile vehicle **110**. A virtual advisor is a synthesized voice interface responding to requests from mobile vehicle **110**. Advisor **155** provides services to mobile vehicle **110**. Advisor **155** may communicate with communication services manager **153** or any other device connected to bus system **156**.

20 **FIG. 2** shows a flow diagram of one embodiment of a method for replenishing calling units for a wireless communication device in accordance with the present invention and shown generally at **200**. In the preferred embodiment, method **200** utilizes a system like that described in **FIG. 1**.

Method **200** begins when a subscriber contacts the call center **150** and  
25 selects a calling unit rate plan (Block **205**). The subscriber may contact call center **150** by phone, the Internet or any other method known in the art.

A calling unit rate plan provides the details of the cellular phone subscription service the subscriber selects. The calling unit rate plan includes several parameters for the subscriber to define. In one embodiment, these  
30 parameters include the duration of the plan, the number of cycles the duration is

divided into and the number of calling units per cycle. These parameters comprise a calling plan termination configuration whereby upon the expiration of the duration or the depletion of the calling units, the calling plan is terminated. In  
5 another embodiment, a rollover parameter may be defined. This parameter comprises choosing whether any unused calling units will rollover into the next cycle. As an example, the subscriber may choose a plan having a duration of one year, the duration divided into twelve cycles (recurrences) and 200 calling units (minutes) per cycle. The subscriber may also choose to have any minutes  
10 left at the end of a cycle to rollover into the next cycle.

Once the plan is selected, a calling plan configuration signal is sent to the telematics unit **120** of vehicle **110** (**Block 210**). The calling plan configuration signal includes data regarding the calling unit rate plan parameters. Once received, the calling plan configuration signal is then used to configure the  
15 telematics unit hardware with the selected parameters (**Block 215**). The number of calling units are stored in memory **125** located within the telematics unit. Referring to the above example, the subscriber's cellular phone is now configured for a plan duration of 12 months, the duration divided into one-month cycles with a limit of 200 minutes in each one-month cycle.

20 As the calling units are used the telematics unit **110** will decrement the available calling units and store the remaining available calling units in memory (**Block 220**). The configured telematics software will also determine whether or not the duration of the current cycle has expired (**Block 225**). If the current cycle has expired the telematics unit software will determine whether there is a  
25 remaining cycle recurrence (**Block 230**). If there is at least one remaining cycle, the telematics unit will reset the number of available calling units to the configured value (**Block 235**) and return to **Block 220**. If it is determined that there are no remaining cycles (i.e. the duration of the plan has expired), the subscriber will be prompted to contact the calling center to select a calling unit  
30 rate plan (**Block 205**). In another embodiment, the subscriber may be given the

option of purchasing a one time calling unit package. The one time unit package would allow the subscriber the ability to continue using the cellular phone and to contact the call center at a later time to select another calling unit plan.

5           If, at **Block 225**, the system determines that the cycle duration has not expired, the system determines whether the calling units are depleted (**Block 240**). If the units have not been depleted, the method returns to **Block 220**. If the units have been depleted but the cycle duration has not expired, the subscriber is given the choice to purchase a one-time calling unit package  
10 (**Block 250**) or wait until the start of a new cycle (**Block 245**).

          In another embodiment of the method illustrated in **FIG. 2** any remaining calling units at the end of a cycle may be rolled over to the next cycle. The remaining minutes are stored in memory located in the telematics unit. In one embodiment, these minutes are stored in a location separate from the minutes  
15 allocated for a new cycle and are depleted before the new amount of minutes are used. In another embodiment, the rolled over minutes are added to the newly allocated minutes with no distinction made between the minutes. For example, if at the end of a 200 minute per month cycle there remains 10 minutes, the remaining 10 minutes are added to the newly allocated 200 minutes made  
20 available at the beginning of the new cycle resulting in a total of 210 minutes available for the new cycle.

          In another embodiment, the method does not allow for the purchase of a one time calling unit package, causing the subscriber to wait for unit replenishment at the start of a new cycle. This method may be attractive to  
25 parents who wish for their children to have a mobile phone when they are driving but without the worry that the child would use the phone beyond the allotted number of minutes per cycle.

In yet another embodiment, the cellular phone is not linked to a telematics unit of a vehicle. In this embodiment a cellular phone includes the necessary hardware and software for implementing a method for replenishing calling units

5 as that described above in **FIG. 2**.

While the embodiments of the invention disclosed herein are presently considered to be preferred, various changes and modifications can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated in the appended claims, and all changes that come within  
10 the meaning and range of equivalents are intended to be embraced therein.